



ATTORNEY DOCKET NO. 07121.0003U1

SEQUENCE LISTING

<110> Sung, Wing
<120> Xylanases with Enhanced Thermophilicity and Alkalophilicity
<130> 07121.0003U1
<140> 09/990,874
<141> 2001-11-21
<160> 71
<170> PatentIn version 3.0
<210> 1
<211> 184
<212> PRT
<213> Aspergillus niger

<400> 1

Ser Ala Gly Ile Asn Tyr Val Gln Asn Tyr Asn Gly Asn Leu Gly Asp
1 5 10 15
Phe Thr Tyr Asp Glu Ser Ala Gly Thr Phe Ser Met Tyr Trp Glu Asp
20 25 30
Gly Val Ser Ser Asp Phe Val Val Gly Leu Gly Trp Thr Thr Gly Ser
35 40 45
Ser Asn Ala Ile Thr Tyr Ser Ala Glu Tyr Ser Ala Ser Gly Ser Ser
50 55 60
Ser Tyr Leu Ala Val Tyr Gly Trp Val Asn Tyr Pro Gly Ala Glu Tyr
65 70 75 80
Tyr Ile Val Glu Asp Tyr Gly Asp Tyr Asn Pro Cys Ser Ser Ala Thr
85 90 95
Ser Leu Gly Thr Val Tyr Ser Asp Gly Ser Thr Tyr Gln Val Cys Thr
100 105 110
Asp Thr Arg Ile Asn Glu Pro Ser Ile Thr Gly Thr Ser Thr Phe Thr
115 120 125
Gln Tyr Phe Ser Val Arg Glu Ser Thr Arg Thr Ser Gly Thr Val Thr
130 135 140
Val Ala Asn His Phe Asn Phe Trp Ala Gln His Gly Phe Gly Asn Ser
145 150 155 160
Asp Phe Asn Tyr Gln Val Met Ala Val Glu Ala Trp Ser Gly Ala Gly
165 170 175

Ser Ala Ser Val Thr Ile Ser Ser
180

<210> 2

<211> 185

<212> PRT

<213> *Aspergillus tubigensis*

<400> 2

Ser Ala Gly Ile Asn Tyr Val Gln Asn Tyr Asn Gln Asn Leu Gly Asp
1 5 10 15

Phe Thr Tyr Asp Glu Ser Ala Gly Thr Phe Ser Met Tyr Trp Glu Asp
20 25 30

Gly Val Ser Ser Asp Phe Val Val Gly Leu Gly Gly Trp Thr Thr Gly
35 40 45

Ser Ser Asn Ala Ile Thr Tyr Ser Ala Glu Tyr Ser Ala Ser Gly Ser
50 55 60

Ala Ser Tyr Leu Ala Val Tyr Gly Trp Val Asn Tyr Pro Gln Ala Glu
65 70 75 80

Tyr Tyr Ile Val Glu Asp Tyr Gly Asp Tyr Asn Pro Cys Ser Ser Ala
85 90 95

Thr Ser Leu Gly Thr Val Tyr Ser Asp Gly Ser Thr Tyr Gln Val Cys
100 105 110

Thr Asp Thr Arg Ile Asn Glu Pro Ser Ile Thr Gly Thr Ser Thr Phe
115 120 125

Thr Gln Tyr Phe Ser Val Arg Glu Ser Thr Arg Thr Ser Gly Thr Val
130 135 140

Thr Val Ala Asn His Phe Asn Phe Trp Ala His His Gly Phe His Asn
145 150 155 160

Ser Asp Phe Asn Tyr Gln Val Val Ala Val Glu Ala Trp Ser Gly Ala
165 170 175

Gly Ser Ala Ala Val Thr Ile Ser Ser
180 185

<210> 3

<211> 185

<212> PRT

<213> *Bacillus circulans*

<400> 3

Ala Ser Thr Asp Tyr Trp Gln Asn Trp Thr Asp Gly Gly Gly Ile Val
 1 5 10 15

Asn Ala Val Asn Gly Ser Gly Gly Asn Tyr Ser Val Asn Trp Ser Asn
 20 25 30

Thr Gly Asn Phe Val Val Gly Lys Gly Trp Thr Thr Gly Ser Pro Phe
 35 40 45

Arg Thr Ile Asn Tyr Asn Ala Gly Val Trp Ala Pro Asn Gly Asn Gly
 50 55 60

Tyr Leu Thr Leu Tyr Gly Trp Thr Arg Ser Pro Leu Ile Glu Tyr Tyr
 65 70 75 80

Val Val Asp Ser Trp Gly Thr Tyr Arg Pro Thr Gly Thr Tyr Lys Gly
 85 90 95

Thr Val Lys Ser Asp Gly Gly Thr Tyr Asp Ile Tyr Thr Thr Thr Arg
 100 105 110

Tyr Asn Ala Pro Ser Ile Asp Gly Asp Arg Thr Thr Phe Thr Gln Tyr
 115 120 125

Trp Ser Val Arg Gln Ser Lys Arg Pro Thr Gly Ser Asn Ala Thr Ile
 130 135 140

Thr Phe Thr Asn His Val Asn Ala Trp Lys Ser His Gly Met Asn Leu
 145 150 155 160

Gly Ser Asn Trp Ala Tyr Gln Val Met Ala Thr Glu Gly Tyr Gln Ser
 165 170 175

Ser Gly Ser Ser Asn Val Thr Val Trp
 180 185

<210> 4

<211> 201

<212> PRT

<213> Bacillus pumilus

<400> 4

Arg Thr Ile Thr Asn Asn Glu Met Gly Asn His Ser Gly Tyr Asp Tyr
 1 5 10 15

Glu Leu Trp Lys Asp Tyr Gly Asn Thr Ser Met Thr Leu Asn Asn Gly
 20 25 30

Gly Ala Phe Ser Ala Gly Trp Asn Asn Ile Gly Asn Ala Leu Phe Arg
 35 40 45

Lys Gly Lys Lys Phe Asp Ser Thr Arg Thr His His Gln Leu Gly Asn
 50 55 60

Ile Ser Ile Asn Tyr Asn Ala Ser Phe Asn Pro Ser Gly Asn Ser Tyr
65 70 75 80

Leu Cys Val Tyr Gly Trp Thr Gln Ser Pro Leu Ala Glu Tyr Tyr Ile
85 90 95

Val Asp Ser Trp Gly Thr Tyr Arg Pro Thr Gly Ala Tyr Lys Gly Ser
100 105 110

Phe Tyr Ala Asp Gly Gly Thr Tyr Asp Ile Tyr Glu Thr Thr Arg Val
115 120 125

Asn Gln Pro Ser Ile Ile Gly Ile Ala Thr Phe Lys Gln Tyr Trp Ser
130 135 140

Val Arg Gln Thr Lys Arg Thr Ser Gly Thr Val Ser Val Ser Ala His
145 150 155 160

Phe Arg Lys Trp Glu Ser Leu Gly Met Pro Met Gly Lys Met Tyr Glu
165 170 175

Thr Ala Phe Thr Val Glu Gly Tyr Gln Ser Ser Gly Ser Ala Asn Val
180 185 190

Met Thr Asn Gln Leu Phe Ile Gly Asn
195 200

<210> 5

<211> 185

<212> PRT

<213> Bacillus subtilus

<400> 5

Ala Ser Thr Asp Tyr Trp Gln Asn Trp Thr Asp Gly Gly Gly Ile Val
1 5 10 15

Asn Ala Val Asn Gly Ser Gly Gly Asn Tyr Ser Val Asn Trp Ser Asn
20 25 30

Thr Gly Asn Phe Val Val Gly Lys Gly Trp Thr Thr Gly Ser Pro Phe
35 40 45

Arg Thr Ile Asn Tyr Asn Ala Gly Val Trp Ala Pro Asn Gly Asn Gly
50 55 60

Tyr Leu Thr Leu Tyr Gly Trp Thr Arg Ser Pro Leu Ile Glu Tyr Tyr
65 70 75 80

Val Val Asp Ser Trp Gly Thr Tyr Arg Pro Thr Gly Thr Tyr Lys Gly
85 90 95

Thr Val Lys Ser Asp Gly Gly Thr Tyr Asp Ile Tyr Thr Thr Arg
100 105 110

Tyr Asn Ala Pro Ser Ile Asp Gly Asp Arg Thr Thr Phe Thr Gln Tyr
115 120 125

Trp Ser Val Arg Gln Ser Lys Arg Pro Thr Gly Ser Asn Ala Thr Ile
130 135 140

Thr Phe Ser Asn His Val Asn Ala Trp Lys Ser His Gly Met Asn Leu
145 150 155 160

Gly Ser Asn Trp Ala Tyr Gln Val Met Ala Thr Glu Gly Tyr Gln Ser
165 170 175

Ser Gly Ser Ser Asn Val Thr Val Trp
180 185

<210> 6

<211> 211

<212> PRT

<213> Clostridium acetobutylicum

<400> 6

Ser Ala Phe Asn Thr Gln Ala Ala Pro Lys Thr Ile Thr Ser Asn Glu
1 5 10 15

Ile Gly Val Asn Gly Gly Tyr Asp Tyr Glu Leu Trp Lys Asp Tyr Gly
20 25 30

Asn Thr Ser Met Thr Leu Lys Asn Gly Gly Ala Phe Ser Cys Gln Trp
35 40 45

Ser Asn Ile Gly Asn Ala Leu Phe Arg Lys Gly Lys Lys Phe Asn Asp
50 55 60

Thr Gln Thr Tyr Lys Gln Leu Gly Asn Ile Ser Val Asn Tyr Asn Cys
65 70 75 80

Asn Tyr Gln Pro Tyr Gly Asn Ser Tyr Leu Cys Val Tyr Gly Trp Thr
85 90 95

Ser Ser Pro Leu Val Glu Tyr Tyr Ile Val Asp Ser Trp Gly Ser Trp
100 105 110

Arg Pro Pro Gly Gly Thr Ser Lys Gly Thr Ile Thr Val Asp Gly Gly
115 120 125

Ile Tyr Asp Ile Tyr Glu Thr Thr Arg Ile Asn Gln Pro Ser Ile Gln
130 135 140

Gly Asn Thr Thr Phe Lys Gln Tyr Trp Ser Val Arg Arg Thr Lys Arg
145 150 155 160

Thr Ser Gly Thr Ile Ser Val Ser Lys His Phe Ala Ala Trp Glu Ser
165 170 175

Lys Gly Met Pro Leu Gly Lys Met His Glu Thr Ala Phe Asn Ile Glu
180 185 190

Gly Tyr Gln Ser Ser Gly Lys Ala Asp Val Asn Ser Met Ser Ile Asn
195 200 205

Ile Gly Lys
210

<210> 7

<211> 206

<212> PRT

<213> Clostridium stercocrarium

<400> 7

Gly Arg Ile Ile Tyr Asp Asn Glu Thr Gly Thr His Gly Gly Tyr Asp
1 5 10 15

Tyr Glu Leu Trp Lys Asp Tyr Gly Asn Thr Ile Met Glu Leu Asn Asp
20 25 30

Gly Gly Thr Phe Ser Cys Gln Trp Ser Asn Ile Gly Asn Ala Leu Phe
35 40 45

Arg Lys Gly Arg Lys Phe Asn Ser Asp Lys Thr Tyr Gln Glu Leu Gly
50 55 60

Asp Ile Val Val Glu Tyr Gly Cys Asp Tyr Asn Pro Asn Gly Asn Ser
65 70 75 80

Tyr Leu Cys Val Tyr Gly Trp Thr Arg Asn Phe Leu Val Glu Tyr Tyr
85 90 95

Ile Val Glu Ser Trp Gly Ser Trp Arg Pro Pro Gly Ala Thr Pro Lys
100 105 110

Gly Thr Ile Thr Gln Trp Met Ala Gly Thr Tyr Glu Ile Tyr Glu Thr
115 120 125

Thr Arg Val Asn Gln Pro Ser Ile Asp Gly Thr Ala Thr Phe Gln Gln
130 135 140

Tyr Trp Ser Val Arg Thr Ser Lys Arg Thr Ser Gly Thr Ile Ser Val
145 150 155 160

Thr Glu His Phe Lys Gln Trp Glu Arg Met Gly Met Arg Met Gly Lys
165 170 175

Met Tyr Glu Val Ala Leu Thr Val Glu Gly Tyr Gln Ser Ser Gly Tyr
180 185 190

Ala Asn Val Tyr Lys Asn Glu Ile Arg Ile Gly Ala Asn Pro
195 200 205

<210> 8

<211> 211

<212> PRT

<213> Ruminococcus flavefaciens

<400> 8

Ser Ala Ala Asp Gln Gln Thr Arg Gly Asn Val Gly Gly Tyr Asp Tyr
1 5 10 15

Glu Met Trp Asn Gln Asn Gly Gln Gly Gln Ala Ser Met Asn Pro Gly
20 25 30

Ala Gly Ser Phe Thr Cys Ser Trp Ser Asn Ile Glu Asn Phe Leu Ala
35 40 45

Arg Met Gly Lys Asn Tyr Asp Ser Gln Lys Lys Asn Tyr Lys Ala Phe
50 55 60

Gly Asn Ile Val Leu Thr Tyr Asp Val Glu Tyr Thr Pro Arg Gly Asn
65 70 75 80

Ser Tyr Met Cys Val Tyr Gly Trp Thr Arg Asn Pro Leu Met Glu Tyr
85 90 95

Tyr Ile Val Glu Gly Trp Gly Asp Trp Arg Pro Pro Gly Asn Asp Gly
100 105 110

Glu Val Lys Gly Thr Val Ser Ala Asn Gly Asn Thr Tyr Asp Ile Arg
115 120 125

Lys Thr Met Arg Tyr Asn Gln Pro Ser Leu Asp Gly Thr Ala Thr Phe
130 135 140

Pro Gln Tyr Trp Ser Val Arg Gln Thr Ser Gly Ser Ala Asn Asn Gln
145 150 155 160

Thr Asn Tyr Met Lys Gly Thr Ile Asp Val Ser Lys His Phe Asp Ala
165 170 175

Trp Ser Ala Ala Gly Leu Asp Met Ser Gly Thr Leu Tyr Glu Val Ser
180 185 190

Leu Asn Ile Glu Gly Tyr Arg Ser Asn Gly Ser Ala Asn Val Lys Ser
195 200 205

Val Ser Val
210

<210> 9

<211> 197

<212> PRT

<213> Schizophyllum cimmune

<400> 9

Ser Gly Thr Pro Ser Ser Thr Gly Thr Asp Gly Gly Tyr Tyr Tyr Ser
1 5 10 15

Trp Trp Thr Asp Gly Ala Gly Asp Ala Thr Tyr Gln Asn Asn Gly Gly
20 25 30

Gly Ser Tyr Thr Leu Thr Trp Ser Gly Asn Asn Gly Asn Leu Val Gly
35 40 45

Gly Lys Gly Trp Asn Pro Gly Ala Ala Ser Arg Ser Ile Ser Tyr Ser
50 55 60

Gly Thr Tyr Gln Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp
65 70 75 80

Thr Arg Ser Ser Leu Ile Glu Tyr Tyr Ile Val Glu Ser Tyr Gly Ser
85 90 95

Tyr Asp Pro Ser Ser Ala Ala Ser His Lys Gly Ser Val Thr Cys Asn
100 105 110

Gly Ala Thr Tyr Asp Ile Leu Ser Thr Trp Arg Tyr Asn Ala Pro Ser
115 120 125

Ile Asp Gly Thr Gln Thr Phe Glu Gln Phe Trp Ser Val Arg Asn Pro
130 135 140

Lys Lys Ala Pro Gly Gly Ser Ile Ser Gly Thr Val Asp Val Gln Cys
145 150 155 160

His Phe Asp Ala Trp Lys Gly Leu Gly Met Asn Leu Gly Ser Glu His
165 170 175

Asn Tyr Gln Ile Val Ala Thr Glu Gly Tyr Gln Ser Ser Gly Thr Ala
180 185 190

Thr Ile Thr Val Thr
195

<210> 10

<211> 191

<212> PRT

<213> Streptomyces lividans Xyl B

<400> 10

Asp Thr Val Val Thr Thr Asn Gln Glu Gly Thr Asn Asn Gly Tyr Tyr
1 5 10 15

Tyr Ser Phe Trp Thr Asp Ser Gln Gly Thr Val Ser Met Asn Met Gly
20 25 30

Ser Gly Gly Gln Tyr Ser Thr Ser Trp Arg Asn Thr Gly Asn Phe Val
35 40 45

Ala Gly Lys Gly Trp Ala Asn Gly Gly Arg Arg Thr Val Gln Tyr Ser
50 55 60

Gly Ser Phe Asn Pro Ser Gly Asn Ala Tyr Leu Ala Leu Tyr Gly Trp
65 70 75 80

Thr Ser Asn Pro Leu Val Glu Tyr Tyr Ile Val Asp Asn Trp Gly Thr
85 90 95

Tyr Arg Pro Thr Gly Glu Tyr Lys Gly Thr Val Thr Ser Asp Gly Gly
100 105 110

Thr Tyr Asp Ile Tyr Lys Thr Thr Arg Val Asn Lys Pro Ser Val Glu
115 120 125

Gly Thr Arg Thr Phe Asp Gln Tyr Trp Ser Val Arg Gln Ser Lys Arg
130 135 140

Thr Gly Gly Thr Ile Thr Thr Gly Asn His Phe Asp Ala Trp Ala Arg
145 150 155 160

Ala Gly Met Pro Leu Gly Asn Phe Ser Tyr Tyr Met Ile Asn Ala Thr
165 170 175

Glu Gly Tyr Gln Ser Ser Gly Thr Ser Ser Ile Asn Val Gly Gly
180 185 190

<210> 11

<211> 191

<212> PRT

<213> Streptomyces lividans Xyl C

<400> 11

Ala Thr Thr Ile Thr Thr Asn Gln Thr Gly Thr Asp Gly Met Tyr Tyr
1 5 10 15

Ser Phe Trp Thr Asp Gly Gly Gly Ser Val Ser Met Thr Leu Asn Gly
20 25 30

Gly Gly Ser Tyr Ser Thr Gln Trp Thr Asn Cys Gly Asn Phe Val Ala
35 40 45

Gly Lys Gly Trp Ser Thr Gly Asp Gly Asn Val Arg Tyr Asn Gly Tyr
50 55 60

Phe Asn Pro Val Gly Asn Gly Tyr Gly Cys Leu Tyr Gly Trp Thr Ser
65 70 75 80

Asn Pro Leu Val Glu Tyr Tyr Ile Val Asp Asn Trp Gly Ser Tyr Arg
85 90 95

Pro Thr Gly Thr Tyr Lys Gly Thr Val Ser Ser Asp Gly Gly Thr Tyr
100 105 110

Asp Ile Tyr Gln Thr Thr Arg Tyr Asn Ala Pro Ser Val Glu Gly Thr
115 120 125

Lys Thr Phe Gln Gln Tyr Trp Ser Val Arg Gln Ser Lys Val Thr Ser
130 135 140

Gly Ser Gly Thr Ile Thr Thr Gly Asn His Phe Asp Ala Trp Ala Arg
145 150 155 160

Ala Gly Met Asn Met Gly Gln Phe Arg Tyr Tyr Met Ile Asn Ala Thr
165 170 175

Glu Gly Tyr Gln Ser Ser Gly Ser Ser Asn Ile Thr Val Ser Gly
180 185 190

<210> 12

<211> 189

<212> PRT

<213> Streptomyces sp. No. 36a

<400> 12

Ala Thr Thr Ile Thr Asn Glu Thr Gly Tyr Asp Gly Met Tyr Tyr Ser
1 5 10 15

Phe Trp Thr Asp Gly Gly Gly Ser Val Ser Met Thr Leu Asn Gly Gly
20 25 30

Gly Ser Tyr Ser Thr Arg Trp Thr Asn Cys Gly Asn Phe Val Ala Gly
35 40 45

Lys Gly Trp Ala Asn Gly Gly Arg Arg Thr Val Arg Tyr Thr Gly Trp
50 55 60

Phe Asn Pro Ser Gly Asn Gly Tyr Gly Cys Leu Tyr Gly Trp Thr Ser
65 70 75 80

Asn Pro Leu Val Glu Tyr Tyr Ile Val Asp Asn Trp Gly Ser Tyr Arg
85 90 95

Pro Thr Gly Glu Thr Arg Gly Thr Val His Ser Asp Gly Gly Thr Tyr
100 105 110

Asp Ile Tyr Lys Thr Thr Arg Tyr Asn Ala Pro Ser Val Glu Ala Pro
115 120 125

Ala Ala Phe Asp Gln Tyr Trp Ser Val Arg Gln Ser Lys Val Thr Ser
130 135 140

Gly Thr Ile Thr Thr Gly Asn His Phe Asp Ala Trp Ala Arg Ala Gly
145 150 155 160

Met Asn Met Gly Asn Phe Arg Tyr Tyr Met Ile Asn Ala Thr Glu Gly
165 170 175

Tyr Gln Ser Ser Gly Ser Ser Thr Ile Thr Val Ser Gly
180 185

<210> 13

<211> 189

<212> PRT

<213> Thermomonospora fusca

<400> 13

Ala Val Thr Ser Asn Glu Thr Gly Tyr His Asp Gly Tyr Phe Tyr Ser
1 5 10 15

Phe Trp Thr Asp Ala Pro Gly Thr Val Ser Met Glu Leu Gly Pro Gly
20 25 30

Gly Asn Tyr Ser Thr Ser Trp Arg Asn Thr Gly Asn Phe Val Ala Gly
35 40 45

Lys Gly Trp Ala Thr Gly Gly Arg Arg Thr Val Thr Tyr Ser Ala Ser
50 55 60

Phe Asn Pro Ser Gly Asn Ala Tyr Leu Thr Leu Tyr Gly Trp Thr Arg
65 70 75 80

Asn Pro Leu Val Glu Tyr Tyr Ile Val Glu Ser Trp Gly Thr Tyr Arg
85 90 95

Pro Thr Gly Thr Tyr Met Gly Thr Val Thr Thr Asp Gly Gly Thr Tyr
100 105 110

Asp Ile Tyr Lys Thr Thr Arg Tyr Asn Ala Pro Ser Ile Glu Gly Thr
115 120 125

Arg Thr Phe Asp Gln Tyr Trp Ser Val Arg Gln Ser Lys Arg Thr Ser
130 135 140

Gly Thr Ile Thr Ala Gly Asn His Phe Asp Ala Trp Ala Arg His Gly
145 150 155 160

Met His Leu Gly Thr His Asp Tyr Met Ile Met Ala Thr Glu Gly Tyr
165 170 175

Gln Ser Ser Gly Ser Ser Asn Val Thr Leu Gly Thr Ser
180 185

<210> 14

<211> 190

<212> PRT

<213> Trichoderma harzanium

<400> 14

Gln Thr Ile Gly Pro Gly Thr Gly Tyr Ser Asn Gly Tyr Tyr Tyr Ser
 1 5 10 15
 Tyr Trp Asn Asp Gly His Ala Gly Val Thr Tyr Thr Asn Gly Gly Gly
 20 25 30
 Gly Ser Phe Thr Val Asn Trp Ser Asn Ser Gly Asn Phe Val Gly Gly
 35 40 45
 Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly
 50 55 60
 Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ser Ile Tyr Gly Trp Ser
 65 70 75 80
 Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
 85 90 95
 Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
 100 105 110
 Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
 115 120 125
 Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Asn His
 130 135 140
 Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
 145 150 155 160
 Ser His Gly Leu Thr Leu Gly Thr Met Asp Tyr Gln Ile Val Ala Val
 165 170 175
 Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser
 180 185 190

<210> 15

<211> 178

<212> PRT

<213> Trichoderma ressei Xyl I

<400> 15

Ala	Ser	Ile	Asn	Tyr	Asp	Gln	Asn	Tyr	Gln	Thr	Gly	Gly	Gln	Val	Ser
1				5					10					15	
Tyr	Ser	Pro	Ser	Asn	Thr	Gly	Phe	Ser	Val	Asn	Trp	Asn	Thr	Gln	Asp
			20					25					30		
Asp	Phe	Val	Val	Gly	Val	Gly	Trp	Thr	Thr	Gly	Ser	Ser	Ala	Pro	Ile
		35					40					45			
Asn	Phe	Gly	Gly	Ser	Phe	Ser	Val	Asn	Ser	Gly	Thr	Gly	Leu	Leu	Ser
	50					55					60				
Val	Tyr	Gly	Trp	Ser	Thr	Asn	Pro	Leu	Val	Glu	Tyr	Tyr	Ile	Met	Glu
65					70					75					80
Asp	Asn	His	Asn	Tyr	Pro	Ala	Gln	Gly	Thr	Val	Lys	Gly	Thr	Val	Thr
			85						90					95	
Ser	Asp	Gly	Ala	Thr	Tyr	Thr	Ile	Trp	Glu	Asn	Thr	Arg	Val	Asn	Glu
		100						105					110		
Pro	Ser	Ile	Gln	Gly	Thr	Ala	Thr	Phe	Asn	Gln	Tyr	Ile	Ser	Val	Arg
		115					120					125			
Asn	Ser	Pro	Arg	Thr	Ser	Gly	Thr	Val	Thr	Val	Gln	Asn	His	Phe	Asn
		130				135					140				
Trp	Ala	Ser	Leu	Gly	Leu	His	Leu	Gly	Gln	Met	Met	Asn	Tyr	Gln	Val
145					150					155					160
Val	Ala	Val	Glu	Gly	Trp	Gly	Gly	Ser	Gly	Ser	Ala	Ser	Gln	Ser	Val
			165						170					175	

Ser Asn

<210> 16

<211> 190

<212> PRT

<213> Trichoderma ressei Xyl II

<400> 16

Gln	Thr	Ile	Gln	Pro	Gly	Thr	Gly	Tyr	Asn	Asn	Gly	Tyr	Phe	Tyr	Ser
1				5					10					15	
Tyr	Trp	Asn	Asp	Gly	His	Gly	Gly	Val	Thr	Tyr	Thr	Asn	Gly	Pro	Gly
			20					25					30		
Gly	Gln	Phe	Ser	Val	Asn	Trp	Ser	Asn	Ser	Gly	Asn	Phe	Val	Gly	Gly
		35					40					45			

Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly
50 55 60

Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp Ser
65 70 75 80

Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
85 90 95

Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
100 105 110

Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
115 120 125

Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Asn His
130 135 140

Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
145 150 155 160

Gln Gln Gly Leu Thr Leu Gly Thr Met Asp Tyr Gln Ile Val Ala Val
165 170 175

Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser
180 185 190

<210> 17

<211> 190

<212> PRT

<213> Trichoderma viride

<400> 17

Gln Thr Ile Gln Pro Gly Thr Gly Phe Asn Asn Gly Tyr Phe Tyr Ser
1 5 10 15

Tyr Trp Asn Asp Gly His Gly Gly Val Thr Tyr Thr Asn Gly Pro Gly
20 25 30

Gly Gln Phe Ser Val Asn Trp Ser Asn Ser Gly Asn Phe Val Gly Gly
35 40 45

Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly
50 55 60

Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp Ser
65 70 75 80

Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
85 90 95

Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
100 105 110

Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
115 120 125

Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Thr His
130 135 140

Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
145 150 155 160

Gln Gln Gly Leu Thr Leu Gly Thr Met Asp Tyr Gln Ile Val Ala Val
165 170 175

Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser
180 185 190

<210> 18

<211> 202

<212> PRT

<213> Fibrobacter succinognees

<400> 18

Asn Ser Ser Val Thr Gly Asn Val Gly Ser Ser Pro Tyr His Tyr Glu
1 5 10 15

Ile Trp Tyr Gln Gly Gly Asn Asn Ser Met Thr Phe Tyr Asp Asn Gly
20 25 30

Thr Tyr Lys Ala Ser Trp Asn Gly Thr Asn Asp Phe Leu Ala Arg Val
35 40 45

Gly Phe Lys Tyr Asp Glu Lys His Thr Tyr Glu Glu Leu Gly Pro Ile
50 55 60

Asp Ala Tyr Tyr Lys Trp Ser Lys Gln Gly Ser Ala Gly Gly Tyr Asn
65 70 75 80

Tyr Ile Gly Ile Tyr Gly Trp Thr Val Asp Pro Leu Val Glu Tyr Tyr
85 90 95

Ile Val Asp Asp Trp Phe Asn Lys Pro Gly Ala Asn Leu Leu Gly Gln
100 105 110

Arg Lys Gly Glu Phe Thr Val Asp Gly Asp Thr Tyr Glu Ile Trp Gln
115 120 125

Asn Thr Arg Val Gln Gln Pro Ser Ile Lys Gly Thr Gln Thr Phe Pro
130 135 140

Gln Tyr Phe Ser Val Arg Lys Ser Ala Arg Ser Cys Gly His Ile Asp
145 150 155 160

Ile Thr Ala His Met Lys Lys Trp Glu Glu Leu Gly Met Lys Met Gly
165 170 175

Lys Met Tyr Glu Ala Lys Val Leu Val Glu Ala Gly Gly Gly Ser Gly
 180 185 190

Ser Phe Asp Val Thr Tyr Phe Lys Met Thr
 195 200

<210> 19

<211> 189

<212> PRT

<213> Asparigillus awamori var. kawachi

<400> 19

Arg Ser Thr Pro Ser Ser Thr Gly Glu Asn Asn Gly Tyr Tyr Tyr Ser
 1 5 10 15

Phe Trp Thr Asp Gly Gly Gly Asp Val Thr Tyr Thr Asn Gly Asn Ala
 20 25 30

Gly Ser Tyr Ser Val Glu Trp Ser Asn Val Gly Asn Phe Val Gly Gly
 35 40 45

Lys Gly Trp Asn Pro Gly Ser Ala Lys Asp Ile Thr Tyr Ser Gly Asn
 50 55 60

Phe Thr Pro Ser Gly Asn Gly Tyr Leu Ser Val Tyr Gly Trp Thr Thr
 65 70 75 80

Asp Pro Leu Ile Glu Tyr Tyr Ile Val Glu Ser Tyr Gly Asp Tyr Asn
 85 90 95

Pro Gly Ser Gly Gly Thr Thr Arg Gly Asn Val Ser Ser Asp Gly Ser
 100 105 110

Val Tyr Asp Ile Tyr Thr Ala Thr Arg Thr Asn Ala Pro Ser Ile Asp
 115 120 125

Gly Thr Gln Thr Phe Ser Gln Tyr Trp Ser Val Arg Gln Asn Lys Arg
 130 135 140

Val Gly Gly Thr Val Thr Thr Ser Asn His Phe Asn Ala Trp Ala Lys
 145 150 155 160

Leu Gly Met Asn Leu Gly Thr His Asn Tyr Gln Ile Leu Ala Thr Glu
 165 170 175

Gly Tyr Gln Ser Ser Gly Ser Ser Ser Ile Thr Ile Gln
 180 185

<210> 20

<211> 194

<212> PRT

<213> Thermomyces lanuginosus

<400> 20

Gln	Thr	Thr	Pro	Asn	Ser	Glu	Gly	Trp	His	Asp	Gly	Tyr	Tyr	Tyr	Ser
1				5					10					15	
Trp	Trp	Ser	Asp	Gly	Gly	Ala	Gln	Ala	Thr	Tyr	Thr	Asn	Leu	Glu	Gly
			20					25					30		
Gly	Thr	Tyr	Glu	Ile	Ser	Trp	Gly	Asp	Gly	Gly	Asn	Leu	Val	Gly	Gly
		35					40					45			
Lys	Gly	Trp	Asn	Pro	Gly	Leu	Asn	Ala	Arg	Ala	Ile	His	Phe	Glu	Gly
	50					55					60				
Val	Tyr	Gln	Pro	Asn	Gly	Asn	Ser	Tyr	Leu	Ala	Val	Tyr	Gly	Trp	Thr
65					70					75					80
Arg	Asn	Pro	Leu	Val	Glu	Tyr	Tyr	Ile	Val	Glu	Asn	Phe	Gly	Thr	Tyr
				85					90					95	
Asp	Pro	Ser	Ser	Gly	Ala	Thr	Asp	Leu	Gly	Thr	Val	Glu	Cys	Asp	Gly
			100					105					110		
Ser	Ile	Tyr	Arg	Leu	Gly	Lys	Thr	Thr	Arg	Val	Asn	Ala	Pro	Ser	Ile
		115					120					125			
Asp	Gly	Thr	Gln	Thr	Phe	Asp	Gln	Tyr	Trp	Ser	Val	Arg	Gln	Asp	Lys
	130					135					140				
Arg	Thr	Ser	Gly	Thr	Val	Gln	Thr	Gly	Cys	His	Phe	Asp	Ala	Trp	Ala
145					150					155					160
Arg	Ala	Gly	Leu	Asn	Val	Asn	Gly	Asp	His	Tyr	Tyr	Gln	Ile	Val	Ala
				165					170					175	
Thr	Glu	Gly	Tyr	Phe	Ser	Ser	Gly	Tyr	Ala	Arg	Ile	Thr	Val	Ala	Asp
			180					185					190		

Val Gly

<210> 21

<211> 76

<212> DNA

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cttttacagc tattgg 76

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<211> 78

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<223> XyTv-2

<400> 22
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tggtctaact ccggaac 78

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<223> Trx-3

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tcttataatc cgaatggg 78

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<211> 74

<212> DNA

<213> Artificial

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<223> XyTv-4

<400> 24

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gaaaatttcg gtac 74

<210> 25

<211> 51

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<223> Trx-8

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<211> 84

<212> DNA

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<220>

<223> XyTv-7

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ccaatgaaaa tgtcgataac cttgctaccg gtaccaccac aatggatatg tttgcccggg 60
cctccgggta aatcgcagtt aacc 84

<210> 27

<211> 78

<212> DNA

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<220>

<223> Trx-6

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tagttgaaga gacctaga 78

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<211> 85

<212> DNA

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<223> XyTv-5

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<211> 58

<212> DNA

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<223> XyTv-101

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<210> 30

<211> 53

<212> DNA

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<220>

<223> XyTv-102

<400> 30

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<210> 31

<211> 59

<212> DNA

<213> Artificial

<220>

<223> Trx-103

<400> 31
cgatcattgg aaccgccacc ttttatcagt actggagtgt tagacgtaat catcggagc 59

<210> 32

<211> 69

<212> DNA

<213> Artificial

<220>

<223> XyTv-104

<400> 32
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ggtacaatg 69

<210> 33

<211> 67

<212> DNA

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<223> XyTv-105

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agctaaa 67

<210> 34

<211> 73

<212> DNA

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<220>

<223> XyTv-110

<400> 34

gttaaagcca tggatgtag gctcatggcc gcggtgtttt aatccgcttc agtgatcact 60

acctaggcat ata 73

<210> 35

<211> 54

<212> DNA

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<220>

<223> XyTv-109

<400> 35

ctatagatgg catgggttgc gcaattagtc ggtagctagt aaccttggcg gtgg 54

<210> 36

<211> 60

<212> DNA

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<220>

<223> XyTv-108

<400> 36

aaaatagtca tgacctcaca atctgcatta gtagcctcga ggccaagcca attatgacgc 60

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<211> 66

<212> DNA

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<220>

<223> XyTv-107

<400> 37
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 catcgc 66

<210> 38

<211> 53

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<220>

<223> XyTv-106

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<212> DNA

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 ccaatttagc gtcaattggt ctaactccgg aaacttcgta ggtggaaaag gttggcaacc 180
 cgggacccaaa aataagggtga tcaacttctc tggatcttat aatccgaatg ggaattcata 240
 cttaagcgtc tatggctggt ctagaaacc actgattgaa tattacattg tcgaaaattt 300
 cggtagctac aatccgagta ccggcgccac aaaattaggc gaagtcacta gtgatggac 360
 cgtatatgat atctaccgta cccaacgcgt taatcagcca tcgatcattg gaaccgccac 420
 cttttatcag tactggagtg ttagacgtaa tcacggagc tccgggttcgg ttaatactgc 480
 gaatcacttt aatgcatggg cacagcaagg gttaacccta ggtacaatgg attatcaaat 540
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<210> 40

<211> 36

<212> DNA

<213> Artificial

<220>

<223> Tx-75A-1

<400> 40

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36

<210> 41

<211> 42

<212> DNA

<213> Artificial

<220>

<223> Tx-105H-1

<400> 41

accggcgcca caaaacacgg cgaagtcact agtgatggat cc

42

<210> 42

<211> 44

<212> DNA

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<220>

<223> Tx-C1

<400> 42

ccaaggcgat cataatgtca ctcgatttct agaacttcga accc

44

<210> 43

<211> 36

<212> DNA

<213> Artificial

<220>

<223> Tx-del(123-144)-1r

<400> 43

cggagctccg acgcgttggg tacggtagat atcata

36

<210> 44

<211> 42

<212> DNA

<213> Artificial

<220>

<223> Tx-105R-1

<400> 44

accggcgcca caaaaagagg cgaagtcact agtgatggat cc

42

<210> 45

<211> 41

<212> DNA

<213> Artificial

<220>

<223> Tx-N1

<400> 45

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41

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<211> 36

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<223> Tx-75-G1

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<212> DNA

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<223> Tx-144R-1r

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actcca 66

<210> 48

<211> 44

<212> DNA

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<220>

<223> Tx-161R-1r

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gtacctaggg ttaacccttg ccgtgcccac gcattaaagt gatt 44

<210> 49

<211> 40

<212> DNA

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<223> Tx-125A 129E-1

<400> 49
ccaacgcgtt aatgcgccat cgatcgaggg aaccgccacc 40

<210> 50

<211> 26

<212> DNA

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<220>

<223> Tx-116G-1

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26

<210> 51

<211> 36

<212> DNA

<213> Artificial

<220>

<223> Tx-118C-1

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gacggatccg tatatgatat ctgccgtacc caacgc

36

<210> 52

<211> 39

<212> DNA

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39

<210> 53

<211> 36

<212> DNA

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<223> Tx-116G118C-1

<400> 53
gacggatccg tatatgggtat ctgccgtacc caacgc

36

<210> 54

<211> 184

<212> PRT

<213> Aspergillus kawachii

<400> 54

Ser Ala Gly Ile Asn Tyr Val Gln Asn Tyr Asn Gly Asn Leu Ala Asp
1 5 10 15

Phe Thr Tyr Asp Glu Ser Ala Gly Thr Phe Ser Met Tyr Trp Glu Asp
20 25 30

Gly Val Ser Ser Asp Phe Val Val Gly Leu Gly Trp Thr Thr Gly Ser
35 40 45

Ser Asn Ala Ile Ser Tyr Ser Ala Glu Tyr Ser Ala Ser Gly Ser Ser
50 55 60

Ser Tyr Leu Ala Val Tyr Gly Trp Val Asn Tyr Pro Gln Ala Glu Tyr
65 70 75 80

Tyr Ile Val Glu Asp Tyr Gly Asp Tyr Asn Pro Cys Ser Ser Ala Thr
85 90 95

Ser Leu Gly Thr Val Tyr Ser Asp Gly Ser Thr Tyr Gln Val Cys Thr
100 105 110

Asp Thr Arg Thr Asn Glu Pro Ser Ile Thr Gly Thr Ser Thr Phe Thr
115 120 125

Gln Tyr Phe Ser Val Arg Glu Ser Thr Arg Thr Ser Gly Thr Val Thr
130 135 140

Val Ala Asn His Phe Asn Phe Trp Ala Gln His Gly Phe Gly Asn Ser
145 150 155 160

Asp Phe Asn Tyr Gln Val Met Ala Val Glu Ala Trp Ser Gly Ala Gly
165 170 175

Ser Ala Ser Val Thr Ile Ser Ser
180

<210> 55

<211> 190

<212> PRT

<213> Artificial

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<223> TrX-H-11D-ML-75A105H-118C-125A129E-144R161R (TrX-H-11D-ML-AHCAE-RR)

<400> 55

Gln Thr Ile Gln Pro Gly Thr Gly Tyr His Asp Gly Tyr Phe Tyr Ser
1 5 10 15

Tyr Trp Asn Asp Gly His Gly Gly Val Thr Met Thr Leu Gly Pro Gly
20 25 30

Gly Gln Phe Ser Val Asn Trp Ser Asn Ser Gly Asn Phe Val Gly Gly
35 40 45

Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly
50 55 60

Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ala Val Tyr Gly Trp Ser
65 70 75 80

Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
85 90 95

Asn Pro Ser Thr Gly Ala Thr Lys His Gly Glu Val Thr Ser Asp Gly
100 105 110

Ser Val Tyr Asp Ile Cys Arg Thr Gln Arg Val Asn Ala Pro Ser Ile
115 120 125

Glu Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Asn Arg
130 135 140

Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
145 150 155 160

Arg Gln Gly Leu Thr Leu Gly Thr Met Asp Tyr Gln Ile Val Ala Val
165 170 175

Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser
180 185 190

<210> 56

<211> 112

<212> DNA

<213> Artifical

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<223> TrX-HML

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<210> 57

<211> 30

<212> PRT

<213> Artificial

<220>

<223> TrX-HML

<400> 57

Gln Thr Ile Gln Pro Gly Thr Gly Tyr His Asn Gly Tyr Phe Tyr Ser
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Tyr Trp Asn Asp Gly His Gly Gly Val Thr Met Thr Leu Gly
20 25 30

<210> 58

<211> 14

<212> PRT

<213> Artificial

<220>

<223> TX-105R-1

<400> 58

Thr Gly Ala Thr Lys Arg Gly Glu Val Thr Ser Asp Gly Ser
1 5 10

<210> 59

<211> 8

<212> PRT

<213> Artificial

<220>

<223> TX-C1

<400> 59

Gly Ser Ala Ser Ile Thr Val Ser
1 5

<210> 60

<211> 13

<212> PRT

<213> Artificial

<220>

<223> TX-75A-1

<400> 60

Asn Gly Asn Ser Tyr Leu Ala Val Tyr Gly Trp Ser Arg
1 5 10

<210> 61

<211> 13

<212> PRT

<213> Artificial

<220>

<223> TX-75G-1

<400> 61

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Asn Gly Asn Ser Tyr Leu Gly Val Tyr Gly Trp Ser Arg
1 5 10

<210> 62

<211> 13

<212> PRT

<213> Artificial

<220>

<223> TX125A129E-1

<400> 62

Gln Arg Val Asn Ala Pro Ser Ile Glu Gly Thr Ala Thr
1 5 10

<210> 63

<211> 14

<212> PRT

<213> Artificial

<220>

<223> TX-105H-1

<400> 63

Thr Gly Ala Thr Lys His Gly Glu Val Thr Ser Asp Gly Ser
1 5 10

<210> 64

<211> 12

<212> PRT

<213> Artificial

<220>

<223> TX-del (123-144)-1r

<400> 64

Gly	Ser	Ser	Arg	Arg	Gln	Thr	Arg	Tyr	Ile	Asp	Tyr
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<210> 65

<211> 7

<212> PRT

<213> Artificial

<220>

<223> TX-N1

<400> 65

Gln	Thr	Ile	Gln	Pro	Gly	Thr
1				5		

<210> 66

<211> 22

<212> PRT

<213> Artificial

<220>

<223> TX-144R-1r

<400> 66

Trp	Ala	Asn	Phe	His	Asn	Ala	Thr	Asn	Val	Ser	Gly	Ser	Ser	Arg	Arg
1				5				10						15	

Asn	Arg	Arg	Val	Ser	Trp
			20		

<210> 67

<211> 15

<212> PRT

<213> Artificial

<220>

<223> TX-161R-1r

<400> 67

Thr	Gly	Leu	Thr	Leu	Gly	Gln	Arg	Ala	Trp	Ala	Asn	Phe	His	Asn
1				5					10					15

<210> 68

<211> 9

<212> PRT

<213> Artificial

<220>

<223> TX-116G-1

<400> 68

Asp	Gly	Ser	Val	Tyr	Gly	Ile	Tyr	Arg
1					5			

<210> 69

<211> 12

<212> PRT

<213> Artificial

<220>

<223> TX-118C-1

<400> 69

Asp	Gly	Ser	Val	Tyr	Asp	Ile	Cys	Arg	Thr	Gln	Arg
1					5					10	

<210> 70

<211> 13

<212> PRT

<213> Artificial

<220>

<223> TX-10H11D-1

<400> 70

Gly Thr Gly Tyr His Asp Gly Tyr Phe Tyr Ser Tyr Trp
1 5 10

<210> 71

<211> 12

<212> PRT

<213> Artificial

<220>

<223> TX-116G118C-1

<400> 71

Asp Gly Ser Val Tyr Gly Ile Cys Arg Thr Gln Arg
1 5 10